NUCLEAR EXPLOSIONS IN SPACE

UNIVERSITY OF MICHIGAN
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CONTENTS

Statement of— Page
Dr. Herbert F. York, Director of Defense Research and Engineering, Department of Defense ---- 1
Dr. Frank Shelton, Technical Director, Armed Forces Special Weapons Project, Department of Defense ---- 10

NUCLEAR EXPLOSIONS IN SPACE

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Friday, April 10, 1959.

EXECUTIVE SESSION

The committee met at 10 a.m., in room B–214, New House Office Building, Hon. Overton Brooks, chairman, presiding.

The CHAIRMAN. We are pleased to have before the committee this morning in executive session Dr. Herbert F. York, Director of Defense Research and Engineering, Department of Defense, and Dr. Frank Shelton, Technical Director, Armed Forces Special Weapons Project, Department of Defense. They are here to describe for the committee the Argus Project nuclear weapon tests in space.

You may proceed, Dr. York.

STATEMENT OF DR. HERBERT F. YORK, DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING, DEPARTMENT OF DEFENSE

Dr. YORK. Thank you Mr. Chairman. * * * What happened was that Mr. Christofilos was working on controlled thermonuclear processes at Livermore on some ideas of his own and also, of course, he was aware of the ideas that other people were working on, too.

In the fall of 1957, as we all very acutely know, the Russians launched their first sputnik. Mr. Christofilos was really personally affected by this as a great many people were, and he was considerably stirred up by the fact that the Russians had pulled off quite an accomplishment and set himself to thinking, trying to think up what he could do about this.

As a result, he invented what has become to be known as the Argus effect or the Argus phenomena, or what have you. One of the bases of thinking of this was his familiarity with some of the other work at Livermore. If I might use the blackboard I could explain some of this a little better. What Christofilos observed is essentially this, if this is the earth, and there is the north—this is the north magnetic pole here, the earth has a magnetic field and the magnetic field lines come around like this, going from one end to the other. If an electron happens to be inserted in here, an electron going with a high velocity, it is caused to go in a circle by the earth's field. It will go in a spiral. So an electron will follow a spiral path like this. When it comes down to this end here, where the field lines are getting closer together, what happens is it turns around and goes back, retraces this path, comes down to this end where the field lines are closer together, it turns around and goes back again. It oscillates back and forth.

This magnetic configuration—should I go back a few steps?

The CHAIRMAN. Yes, if you would.

Dr. YORK. What I have drawn here is this large circle representing the earth with the north magnetic pole and the south magnetic pole. These lighter lines represent lines of the earth's magnetic field. This spiral path in here is the path an electron would follow if injected into the earth's magnetic field, say, at this point.

It makes a spiral which goes back and forth. When it gets down at this end close to the ground where the field is stronger, it is turned around by what is called the magnetic mirror, finds another magnetic mirror, and goes back and forth. This configuration is similar to one that has been proposed for use in the lab in connection with the controlled thermonuclear project which is what stimulated Christofilos to think of this connection with the earth.

The trapping of the electrons is simply due to the shape of the earth's magnetic field. The source of the electrons which Christofilos proposed was an atomic bomb. If you explode now, at a point up here, say here, actually anywhere inside of this sort of moon-shaped thing, if you explode a bomb the first thing that happens, of course, is that you release tremendous amounts of energy, heat, light, and so on. But you also produce lots of radioactive nuclei. These are the same nuclei that are part of the fallout problem that we are all aware of. Most of these radioactive nuclei decay in a few minutes. Many of them are around for years. But most of them decay in a few minutes.

When they decay they produce high-energy electrons. So that the bomb explodes, the debris spreads out, fills up a volume which if it is out in space might be hundreds of miles across. But it fills this volume with radioactive nuclei. They produce these high-energy electrons which leave this cloud of debris, get into the earth's magnetic field and are trapped on these paths. For a somewhat more complicated reason, as well as going back and forth this way, this volume tends to spread out around the earth this way, into the blackboard. Eventually what happens within the order of a half hour to an hour is that you get a region, say, bounded by this magnetic line, and this line, but then continue this line around in a cylindrical way so it is over here on the other side, too. This gets filled up with these spiraling electrons, and so on, all the way around the earth.

You get a region of which this is the cross section but it extends all the way around the earth. This spreading takes a matter of about an hour. What Christofilos had in mind at first—when he first got the idea for the use of this—was that this would produce on any object which might be orbiting the earth and pass through this region, it would produce high-intensity radiation inside. And therefore this could be used as a means of stopping or preventing manned satellites. That was an original idea. That is what he invented it for, a means for prohibiting manned satellites.

As I said, he was sort of personally upset by sputnik and he decided he was going to do something about it and came up with this invention.

To make a long story short at this point, or to anticipate questions, it has turned out since that this is probably not an effective way of preventing manned satellites, because the end of this thing simply doesn't come close enough to the ground, that is, there is

room—here the earth's atmosphere as you know it is a very thin thing that surrounds the earth. In order to have a satellite you have to be above the atmosphere. But there is room for a satellite above the atmosphere but below the lowest point at which you can maintain this. So there is a place for satellites right in here, in the way of polar satellites. And for equatorial satellites which go around this way, it just turns out there is plenty of room underneath this shell for the satellite. That was not obvious at the time. It took quite a while to actually work out enough of the details to know.

But when this was first proposed, we didn't know just exactly what kind of a thing we had a hold of, we didn't know whether we had something which had very great military significance or whether we had something that might only be a curiosity or just what. For that reason, simply because we could not really cope with this idea, we decided the safest thing to do was to keep it at a very high level of security until we could work out just what the problem was, what we had a hold of.

I mentioned one effect that Christofilos first thought of, that was that you could with these bands of trapped electrons interfere with the satellites. Subsequently another idea came up. As we have gone along, and this has had further study, some additional ideas of possible military applications of this have occurred. A second one that came up relatively early was the following: These electrons as they spiral in these orbits do produce very small amounts of radio waves, that is, electron by electron occasionally a little radio wave is produced. The more electrons, the more of these radio waves. They are produced in all frequencies and therefore they constitute noise, that is, static. So that a few—if you deliberately put electrons into a shell like this, put enough of them, they will produce a radio static on the ground and this static can interfere with radio communication, can in principle interfere with radio communication, and it can also interfere in principle with radar operation.

Again, it has happened as a result of further study, but we did not know this at the time. It has happened as a result of further study that * * *. At the time when this first came up we didn't know that. The notion came up that here was a possible way of interfering with radar and also radio, and if this effect was large it was obviously of great military interest and something we wanted to protect. * * *

While we aren't there yet, we are getting closer. That is with regard to the worldwide effects.

There is another group of effects here, and these * * * although they are a little odd and we don't quite know what to do with them. This is something that has badgered us all through this program. It is such a grand and complicated scale that it has been difficult for us to really come to grips with it and figure out just what it is we are dealing with and what its worth would be. There are some other effects which are as follows: When you explode a bomb at a point like this, in addition to producing these electrons which were the original concepts, which is what the original Argus idea was focused on, you also, of course, produce fission products, and other things of that sort. * * *

Also there are * * * electrons which are not trapped by the earth's field. * * * The other * * * percent plunge into the earth's atmos-

phere and produce an aurora. They come down here and they produce one here. Others of them come around here, plunge down here, and they produce an aurora in this region.

These auroras are things which can interfere with local communications, that is, not worldwide communications, but they have local communications effects very similar, if they are intensive enough and it is a matter of degree obviously, if they are intensive enough this interference is similar to that which we observed in connection with the high-altitude shots in the Pacific. That is, you form a * * * region through which it is difficult to get radio waves. It is difficult to communicate when this happens, it is difficult to communicate from here to here. The radio waves go this way and find it hard to get through.

This is a local phenomena * * *. It happens at two places in the earth which are quite remote from each other. In principle, a possible use for this is to, if there was a region up here and this happened to be over Russia or some point in the Middle East, where you wanted to interfere with Soviet communications, instead of exploding a bomb there you could go way down here which would be in the southern part of the Indian Ocean, explode a bomb here and for a matter of * * * afterward it would interfere with communications up here.

Mr. McCormack. Can you control it?

Dr. York. Probably you can control the place * * *. We can control the place, * * *. This series of things is the concept of the idea. The initial idea came up late in 1957. These other notions of worldwide interference came along early in 1958. These notions of local interference at the two ends of this line have * * * come up * * *. These are some of the ideas.

The history of what was done with these ideas is that, first Christofilos thought of them, as I said, and it just happened that I was the first person with whom he discussed these. Within a month after he discussed them with me, I was appointed to the President's Science Advisory Committee. There is no relation here, but it is a sort of coincidence which has carried all through, and because it was both interesting and also of unknown consequences at that time I described it to the committee. They became most interested and further experts and so on were called in to discuss this general question, whether an experiment should be done to check some of these things out, whether the ideas were sound and so forth. It was agreed that the ideas were probably sound and that if we could, it would be worth doing an experiment.

The question was how to get an experiment done and what was decided then was that ARPA would be the executive agent for us and that the Armed Forces Special Weapons Project would actually perform the management of the program. That is why I asked Dr. Frank Shelton to come along.

Via the next step in a series of coincidences I was the chief scientist of ARPA. It was decided we ought to do this. We discussed the situation. Another thing happened at this point. This was in early 1958. Also in early 1958 the first Explorers were launched, the first American satellites. These satellites observed this large amount of radiation which is already in space from natural causes which we now call the Van Allen Belt. The Van Allen Belt has a source which is similar to what Christofilos proposed except it is proposed by cosmic

radiation rather than by manmade nuclear radiation. Nevertheless, there is a great similarity between the two. If you remember back last spring and summer there was one of the—it was said that one of the outstanding results of the IGY year was the discovery of this natural belt of radiation. As a consequence of the discovery theorists both in the United States and in the Soviet Union began to speculate on the origin of this radiation, and were able to arrive at this similar series of ideas, that show electrons were released, they oscillated back and forth between mirrors at the end and were trapped. It was said this was an unexpected and unusual discovery and that is almost true. The fact is that Christofilos had anticipated it by a fair 4 or 5 months but his work was still secret because we were still wrestling with this question of what kind of a bear we had by the tail. The Van Allen Belt was really anticipated, in fact was not only anticipated but a method for artificially producing it was invented before it was even discovered, which I think is a remarkable intellectual achievement on the part of Christofilos.

Because of the presence of the natural belt we were thrown into something of a tizzy. The fact that there were already a number of electrons up there would make it more difficult to observe this artificial effect if it were produced. That threw a couple of months delay in our planning while we, Dr. Shelton and I, and a number of other consultants, Christofilos, worked with Van Allen and the IGY people to see what could be done to modify the equipment in the Explorer to emphasize this artificial belt over the natural belt, what could we do to make it easy to detect this in the presence of the natural radiation. With the help of quite a few people, some rather simple but essential modifications in the Explorer IV instrumentation were conceived and built into the equipment. Because by this time we had come to the conclusion that this program could be done, that is, we could actually do the Argus experiment only if we used essentially existing equipment and if we could beat this background problem. So we finally came to an operational plan which involved sending the *Norton Sound* which is a naval vessel down here to a point in the South Atlantic, and I will get to why we chose the South Atlantic in a few moments, we sent the *Norton Sound* down here, equipped it with rockets which were similar to a type which the ballistic division had done for nose cone reentry. Put an atomic bomb on the top and fired it up * * * high * * * with the combination of rocket * * *. The altitude was chosen * * *. At the same time, Explorer IV was launched and the IGY people were going to launch it anyway, so that from us they simply received extra stimulation and some advice on the modification of the payload. Explorer IV was set into orbit, an orbit that had both a high inclination to the Equator in such a way that it actually passed through the expected region where this radiation would be 4 times each orbit or something a total of 30 times a day, although we weren't always able to read it. So as to Explorer IV, we didn't arrange for Explorer IV but we did back up the plans and help get it off. It was arranged to have Explorer IV and it was also arranged to have some small rockets that went up from the ground, called Project Jason, which had instrumentation for measuring radiation in them. These were for the purpose of back up—well, perhaps the most single important purpose was simply in case

the satellite didn't work, because not all satellites work, we had to do this before the moratorium came on. Remember at this time there were plans for no more tests after the 1st of November, and at the same time we were planning this that date might have been as early as the 1st of September and there were not many acceptable chances for failure.

We arranged for some small rockets to go up and back through this shell this way. These were fired from Wallops Island, Cape Canaveral, and Puerto Rico. We sent out some ships in what was the vicinity of the Azores. The bomb was fired down here from the ship; it produced an aurora here and here. In the region of the Azores we arranged for ships and aircraft to go up here with * * * equipment * * * which are suitable for detecting an aurora. All these arrangements, incidentally, were made within just a couple of months because the final decision to go ahead came toward—it was in May, and the Explorer was launched the end of July.

I have the details of exactly what happened. Let me say some of the things that happened and let me distinguish between what is still classified and what is not as we go along. We have tried to separate—one reason that we have been so long in clearing this, and, of course, we never did actually arrive quite independently at the conclusion to release this information, although we were getting there on our own, is that because of the great complication here it simply took the order of 6 or 7 months to get the data reduced.

In fact, we got the last information in final form from one of the most important papers involved less than 2 weeks before the story was released in the newspapers.

Our objective had been to get these papers all together, try and sort out what should remain classified and what could be released because of its scientific interest. We are still in the process of doing that.

As you know, there has been a lot of gun-jumping which is out of our control. There were shots fired from this point in the end of August and the beginning of September. We wanted them all at about * * * miles, * * *. The newspapers published the altitudes as 300 miles. We have simply let it stand there. All that we have said is that the shotburst was well outside the earth's atmosphere. The reason for keeping this classified is that one of the ideas and—practically everything that was seen in this experiment confirms the ideas of Christofilos and the others who worked on it, * * *.

Mr. McCormack. Will you tell us why you sent that vessel down to the South Atlantic?

Dr. York. At the same time as we were planning all of this there was an Operation Hardtack in the South Pacific. In fact, actually in the North Pacific just over the Equator. This is about as far away as you could get and obviously requires some explanation. It cost us a lot of effort to go here instead of doing it where the other operation was. The reason I am afraid is a little complicated. But it has to do with the details of the shape of the earth's magnetic field. * * * Two places could be used to produce the effects, they are fairly large areas. One is in the South Atlantic, an area of an order of 1,000 miles on a side, roughly at 45° south, and anywhere between zero and 30 west. The other place we could have done it is up at the Azores. The choice between those two is more or less obvious. There simply is less

traffic and commotion down here in the South Atlantic than at the Azores. The reason why it had been one of those two places instead of somewhere else has to do with the details of the earth's magnetic field.

First of all, it has to be roughly at 45° north or south simply because if you do it close to the Equator in this region these lines go back and forth with a very shallow slope here and the thing becomes very short and the electrons won't last very long. If you do it too far north, the magnetic lines are not closed. They go out into space and they join the sun's magnetic lines and so forth, and there is no trapping. The combination of these two reasons is why you have to pick roughly 45, it could be 35 or 55 north or south. Why it has to be in the Atlantic instead of the Pacific this has to do with the fact that the earth's magnetic field is not centered at the center of the earth but rather at a point which is something like 200 miles off center and in this direction. An electron that goes back and forth with its mirror 300 miles above the surface, over on this side because of the eccentricity it will be about 700 miles above the surface. On the other hand, if you put one here at 300 miles above the earth and it went back and forth, when it came back to this side it would be below sea level. It can't be trapped. This is a pure coincidence or it is for reasons unknown, the earth's magnetic field is not centered on the earth. For this reason, we went into the Atlantic. Because of this eccentricity it has to be somewhere in the Atlantic because you can't go near the poles or Equator. It has to be somewhere 45 north or south. Because there is traffic in north, you have to do it in the South Atlantic. It certainly was for us the most awkward place to do it, because we had an operation going elsewhere. We had to make special effort to get down here. It was very windy. * * * It was a last resort, but it was only a resort to go down here to the South Atlantic.

We have released the fact that these took place between zero and 30° west and that they were at 45° south * * * latitude. * * * If there is some good reason for giving these more precisely, after further security study, we may very well come to the conclusion it is worth doing.

As I say, we are still having a hard time sorting all these data. As to the times we have simply said that they were fired in the early morning of the 27th, the early morning of the 30th, and shortly before midnight on the 7th of September. I have the detailed times here if anyone would like them.

The reason for keeping the precise time secret is that when you explode a bomb anywhere around the earth, there are certain radio signals which are produced. The observation of these radio signals are important in connection with detecting explosions. There were some signals produced by this bomb. * * * We don't think it is to our benefit to help the Russians find these signals in their electromagnetic recordings.

The signals are * * * so that if we don't say exactly what time this was, we don't think they can find it. We are planning on releasing the time of the shot to within the nearest 10 minutes. * * * That is good enough to be useful in connection with the scientific application of this data, but it is vague enough so that we think that the Russians can't work this down to the point where they can know what kind of signals this produced.

I have given some of the details on when the shots took place, where they took place, and what altitude. * * * The official released yield is simply to say that it was small. * * *

It is obviously so small compared to what has been done and at this enormous altitude that there is no fallout here. As to the actual yield it is something that we are still studying as to whether there is any damage in releasing it. If you know how many electrons were trapped you know the efficiency for trapping. For most of the scientific value it is not necessary to know the efficiency. We don't know what value there would be in terms of weapons effects to release this efficiency. Unless there is good cause we intend to keep the yield secret simply to keep the efficiency secret. * * *

The official statement is that the yield is small. * * *

So much for the bomb itself. The Explorer was launched a month before these shots took place, and during that month what it was observing was the natural background in greater detail than it had been observed in our earlier Explorers or the sputnik. All the data that the Explorer got before the shot was essentially promptly released as part of the IGY information. What they found, and let me leave this half on and then I will draw another smaller world on the other side. Here is the earth. Explorer found that there were two natural radiation belts. One like that and one out here like this. These are cylindrical around the earth also. By a coincidence, our artificial belt was placed right in between. We didn't plan it that way. That is just how it came out. It was rather good luck that it did. While we could have observed it if it was inside this one or this one, it would have been much more difficult. It was much easier to observe here. It was observed, again referring to this picture, it was observed on some 250 passes of the satellite. The satellite went through this thing 250 times. It was observed to be of a thickness of about 200 kilometers, 100 miles. The thickness varies with the altitude. This is what it was at something like 800 miles above the surface. Out here where the belt reached 4,000 miles it wasn't measured but it must have been 1,000 miles across. It was observed to be 200 kilometers across. It was observed that the thickness did not change and that the radiation lasted for a period of many days, possibly several weeks at the low altitude, and there were some indications up here that the artificial radiation was still there several months after the experiment. Down here for a matter of a week or so.

It was very easy to observe, there is no question but what it was seen. The tapes, the recordings from the Explorer satellites are just crystal-clear that they observed this artificial radiation belt. In magnitude the artificial belt was many, many times greater than the background in this region right in here. But it was about equal, and I am not sure within factors of 2 or 3, but within factors of 2 or 3 this was about equal to the highest natural level in either of the two natural belts.

The rockets which we fired from the ground also went through it successfully and we got measurements from them. In addition, up here at the Azores I said we did set these aircraft and ships in position. They did observe the aurora. It was like a natural aurora except it was entirely in the wrong place. An aurora in the Azores is unusual. It was not right in the Azores. It was off to the west, 1,000 miles and

it was not observed by anybody who did not go out there to observe it. There were statements in the press that there were worldwide effects of these shots. There were no worldwide effects as far as we know. No one saw this outside of people that were specifically sent to see it. We did observe some radio reflections from this aurora but they were just like, except possibly a little weaker than, the same kind of reflections that you get from aurora. In fact, one of the reasons we chose the * * * yield was to deliberately hold down any possible widespread effects, so not to create a public nuisance and also if there were some important radio effects so that it would be real hard to see them, and if we saw them we would be the only one who did.

There were some very small radio signals observed in this end which were instantaneous, didn't last. There were some effects due to the disturbance of the earth's magnetic field up at this end which were observed local but only local. The earth's field down here was modified on the ground. This disturbs the whole field. * * *

If it was an extremely large detonation there would probably be a pronounced effect. As far as we know, there were no observable worldwide effects. We have reviewed all sorts of records. Statements in the press to the effect that there are effects as far as we can tell, are based on a confusion of these shots with the high altitude shots in the Pacific which did produce large-scale disturbance. As far as we know, there are absolutely no worldwide effects from this shot whatsoever. We deliberately set out to find any there might be. We are convinced that nobody else who think they have something that was connected with it is correct. It is a gross exaggeration and based on confusion with the Pacific shots.

That is where we stand. We did observe it. We found the two auroras. We found the belt. The aurora lasts for about an hour. The radiation belt for weeks. Everything more or less checks out with the expectations, * * *.

The facts that the Explorer has discovered, the details that the satellite found in passing through this cloud, the details that the rocket found and some of the information about that aurora—all are being released. There will be meetings at the American Physical Society at the end of this month. There will be meetings at the National Academy of Sciences later this month. The data found at this end of the world will be released. The details on the bomb, the altitude, the precise yield, the precise times and * * * the precise latitudes, * * * will remain classified. * * *

The value of the scientific data is simply that it confirms the ideas, the theories that were developed about the natural radiation belt, explains much more about the origin of the natural belt that has been discovered. It traces out in detail certain features of the earth's magnetic field that it has never been possible to trace out before. From a result of this we know quite a bit more in detail about the shape of the earth's magnetic field than before.

It actually reflects some information back into the control thermonuclear project where this idea was born in the first place, because in that project it never has been possible to get electrons trapped between two mirrors for a long enough time to be certain that they would not migrate out sideways.

Here where there is a really good vacuum, of course, much better than we can get on the ground, we have put electrons in a field shaped like one of the Sherwood machines and found they lasted a week. That reflects back as useful into control experiments. As far as the weapons effects are concerned, while we want further time to digest them, by and large what we found is that the principal effects have to do with * * *. That is in outline the situation, both the classified and the unclassified parts mixed together.

The CHAIRMAN. Thank you.

Does Dr. Shelton want to make a statement at this point?

STATEMENT OF DR. FRANK SHELTON, TECHNICAL DIRECTOR, ARMED FORCES SPECIAL WEAPONS PROJECT, DEPARTMENT OF DEFENSE

Dr. SHELTON. May I say one word about the locations? When one is attempting to sort out from a very complicated experiment that which he would like to keep classified and that which you know is of value to the International Geophysical Year, that probably is available to the U.S.S.R. from its own satellite—this has been a very difficult process, one in which you must keep ahead of everybody else in what they are writing.

I think Dr. York covered those areas in which we are trying to keep classified, (1) the altitude of the shots, * * * so we have tried to keep the actual altitude classified. It turns out that you must at the same time keep the exact locations of the shots classified if you are going to maintain the altitude classified. It has to do with, if you tell me exactly where you launched the shots, and we do intend to release the shape of the magnetic sheet as given by the Explorer data, therefore all you have to do is go above the launch point, intercept the magnetic sheet which will be defined quite accurately by the altitude. I have seen it plotted and have helped plot the magnetic sheet as obtained by the Explorer satellite data. There is beautiful precision. I want to reiterate the shot location; if you give the locations, you do give the altitude. What is the important part of the location? It is the latitude that gives you the height, and not so much the longitude. I think we would release if need be the longitude; it could be well defined if the Explorer tapes need that explanation.

So the latitude, the altitude, are a kind of hand and glove. The yield, while we think "small," is sufficient for most of the people. * * * That should fulfill most scientific requirements. The injection efficiency that you have been given, we feel, is not important to most of these scientific experiments. Those are the four things. I think the DOD * * * future in the area, * * * under those guidelines.

The CHAIRMAN. We are going to do this—submit the transcript to you and Dr. York and when you have deleted it, we will release the balance.

Dr. SHELTON. My remarks were to show you how intricate things are and how they are related.

The CHAIRMAN. Are there any military—is there any military value now at the present time to that experiment?

Dr. YORK. We are studying that. We have quite a few people reviewing this. The most likely military value is the one I

mentioned * * * It is rather interesting, as you know. The high altitude shots in the Pacific interfered with communications where they occurred—communications in the vicinity of the Hawaiian Islands. Here is an opportunity: If instead of being small, if this bomb had been very large, then shooting it in the South Atlantic would probably have interfered with communications across the North Atlantic. So that it gives you the odd opportunity of firing a bomb in a completely remote part of the world which is under your control—or under no one's control, perhaps—and producing a communications interference at a place which is not available to you.

In other words, if we fired this bomb in the Indian Ocean we could have disrupted shortwave communications in the vicinity of Moscow. * * * That is somewhat speculative still. In order to do that it would take a bomb of large yield and not this little bomb. We are not sure how these phenomena scale. We are not sure if we did it with a large yield bomb we would have gotten * * * times the effect. We are still calculating that. We have quite a few people working on it. It is a rather interesting possible weapons effect. It is not as direct as producing blast or damage of that sort, but it is an interesting concept that by exploding a bomb in the South Indian Ocean you can produce—you can interfere with communications at Moscow, or if you do it in the South Pacific, somewhere around the tip of South America, you can interfere with communications in Washington.

You will get a huge aurora if you do this over Tierra del Fuego. You will get a huge aurora overhead here and all our communications will be out for * * * afterward.

The CHAIRMAN. How does that aurora differ from the so-called aurora borealis?

Dr. YORK. If you do it with a small bomb like this, it is similar; with a large yield bomb it is similar except in greater magnitude.

The CHAIRMAN. It produces lighting effects?

Dr. YORK. Yes, if done at night. If you do it at the tip of South America, it will light the sky over Washington very brightly.

The CHAIRMAN. It produces an electrical storm?

Dr. YORK. Yes, and it interferes with electrical communications like other storms.

The CHAIRMAN. Radio communications, television communications?

Dr. YORK. Yes.

The CHAIRMAN. What other type of communications? Telephone?

Dr. YORK. It wouldn't interfere with either very high frequency communications or with line-of-sight communications. It wouldn't interfere so much with television, as a matter of fact. It is long-distance communications that it interferes with.

The CHAIRMAN. * * *

Dr. YORK. * * *

The CHAIRMAN. * * *

Dr. YORK. * * * We went down there with three missiles because we knew it would be difficult to fire any in the South Atlantic because of the stormy nature of the weather. We went down with three. We fired all three. * * *

The CHAIRMAN. Mr. McCormack.

Mr. MCCORMACK. No questions.

Mr. FULTON. We are glad to have you here. It was a very adequate explanation. The question comes up, what would be the lower limit on such an effect if you have already found there is an effect at * * * miles?

Dr. YORK. We don't know. There would be some effect certainly at considerably lower altitudes. The high altitude shots in the Pacific which were respectively * * * miles and * * * miles, there was a similar effect in connection with the * * * mile shot. But the configuration of the earth's magnetic field is such that we were not able to learn very much about it. It was simply in the wrong location to produce any worldwide phenomena. It was observed that due to the shot at Johnston Island there was radio interference at Samoa. So you can produce an effect at * * * and possibly even as low as * * * miles, but it is not as efficient.

Mr. FULTON. It really comes down through that oxygen radial band at about 60 miles.

Dr. SHELTON. The ozone layer, yes. You can get interference below * * * the ozone layer.

Mr. FULTON. The ozone layer does not actively reflect as a mirror.

Dr. YORK. No.

Dr. SHELTON. * * * Electrons born in the vicinity of like 40 miles high would die within seconds. * * *

Mr. FULTON. What is the timelag on the causation of the aurora borealis at the other end of the mirror?

Dr. YORK. It is fractions of seconds.

Mr. FULTON. Is that the speed, the speed of light?

Dr. YORK. It is somewhat slower, a 10th or less, but nearly. These electrons that are produced are going with about the velocity of light. You have to wait, it builds up little bit slowly, you have to wait until the electrons are produced by the radioactive nuclei. Some are produced in a second. You don't get the bulk of them until you wait the order of a minute. Then they have to travel down to the other end. The electrons are traveling with nearly the speed of light, about 90 percent. On the other hand, they have to take this corkscrew path which multiplies the time by the factor of a few. You have put it all together and it first shows up at about 1 second. But it reaches its maximum a quarter of a minute later. The measurements at the other end have some effects on the earth's magnetic field, the onset of any important effect was at about 13 seconds after the burst and lasted for another 13 or 20 seconds.

Mr. FULTON. Actually, these electrons are then traveling between the two mirrors and within a fairly defined corkscrew path and they are not then just like one brick against another brick in the wall setting up a reaction from other electrons that are there.

Dr. YORK. Both things happen, Mr. Fulton. Only about * * * percent of them apparently are actually held by the mirrors, that is, are reflected between the two traps. Exactly what happens to all of the other * * * percent we really don't know. But certainly a large fraction of them, of the order of half, are driven down into the atmosphere at this end, where it was fired. Something like the other half, but there is very great uncertainty here, something like the other half follow the corkscrew path, but before they can be reflected they get down into the atmosphere and do strike other atoms, cause other

reactions and so forth, before they can be reflected. Only about * * * percent of them are reflected before they actually strike the atmosphere so that they can be going back and forth. Once they get well down into the atmosphere, they can't be reflected. They will be making interactions with the electrons there. The aurora at the two ends are due to those electrons which are not trapped in the mirror. That is the * * * percent.

Mr. FULTON. The point I would like to make, then, is have you made any investigation of the type of mirror which causes the reflection?

Why is that?

Dr. YORK. The sequence is this: It was first theoretically invented, the so-called magnetic mirror was conceived in connection with Sherwood. Then also in connection with Sherwood it has actually been designed and magnet mirrors have been built and work. The reason they work is a little hard to explain. You see, I mean by that only it is somewhat complex. It is well understood. It has to do with the fact that, if you have an electron spiraling into a region of increasing magnetic field the pitch of the spiral gets constantly smaller and finally it gets flat and comes back again. This has to do with certain basic properties of the interaction of electrons in magnetic fields.

Mr. FULTON. In every point on earth there is another point in space which has a reflective power through the action of the vortex of the electrons——

Dr. YORK. Not at the polar regions. But anywhere except at the polar regions you could do this.

There are good places and there are bad places.

Mr. FULTON. On this particular reaction there where it interferes with long distance communications, except line-of-sight and high frequency communications, radio, would it not really have a tremendous strategic effect on our United States * * * to get through radio, radar, and other communications that Russia or any Iron Curtain country might have set up as a defense?

Wouldn't they then get the place like Moses leading the children through the Red Sea—have an opportunity to have our strategic air force pass into Russia without detection?

Dr. YORK. That is one of the things people had in mind here. * * *

Mr. FULTON. Should we not then have research into a change of the strategic positioning of our United States * * *? Should we not then plan new tactics and have a different strategic place for them?

Dr. YORK. I do not have an answer for that question. I can say the possibility of this influencing that is taken into account.

We have, right from the start, had questions as to how does this influence what we are already doing. We do not have many answers because it is not a simple question. But it has been an objective of intensive study from the start. That is part of this overall reason for why we have kept this so highly classified because we were afraid of things of exactly that sort.

What is this going to do, not just what it will do to them? This could be done, incidentally. They could be firing bombs at a high altitude for who knows what reason: Interception or something like that, and do something like that.

The CHAIRMAN. Suppose you were in the Indian Ocean and started this reaction, this experiment; how wide would the effect be around

Moscow and would it put up a radio umbrella there to protect our Air Force?

Dr. YORK. It would affect an amount which is not really clear, but probably the order of * * * miles across.

The CHAIRMAN. Which is a sizable distance.

Dr. YORK. Yes; it would interfere with communications.

It would also interfere with radar but not to the same extent. * * *

The Russians would have a hard time getting radio unless from Leningrad to Moscow to Vladivostok.

Mr. FULTON. Did you have * * * installations set up for these experiments?

Dr. YORK. * * *.

Mr. FULTON. Did it interfere with the * * * stations?

Dr. YORK. There was minor interference. There was interference but it was minor.

Mr. FULTON. Could it not be built up higher——

Dr. YORK. This is one of the rare occasions where the defense can get ahead of the offense * * *.

Mr. FULTON. It would require a complete reconstruction of Russia's * * * both outer and inner * * *.

Dr. YORK. That is to get around it completely. * * *.

Mr. FULTON. On a * * * like this would it be possible through this method to jam it or limit its capacity for a short or long time?

Dr. YORK. * * *.

Mr. OSMERS. How long do you intend to continue? You have been asking questions for about 12 minutes.

Mr. FULTON. I still have the time, I believe. I have one final question.

The question had been previously on the traveling of electrons. And my other question had been as distinguished from the paths of particles of matter, whether there was not the exciting of other electrons already there.

Dr. YORK. There is, at the end. As the electrons from this enter from either end they do, in entering the atmosphere, produce a great many electrons and atoms as they go in. That is what produces the communications and the visible light and so forth.

That is, what causes the phenomena is the production of other electrons as the thing enters.

Mr. ANFUSO. When you testified here before on * * * you had certain reservations. Is this knowledge which you have conveyed to us today of any—does it have anything to do with the reservations that you had at that time?

Dr. YORK. Not importantly.

Mr. ANFUSO. To a certain degree.

Dr. YORK. There is a related phenomena to this which affects that but which we did discuss at that time, probably not very clearly.

In the immediate vicinity of the shot, not even at the other end, there are some very intense effects produced immediately below the point of the shot which are not part of this Argus phenomenon but which were observed in the Pacific Islands shot which we did discuss, where there are some short time interferences * * *. This lasts for tens of seconds. There are some others that might occur that we have not had good enough information on that might last for minutes. We do not have good information on those. * * *

Those have all been brought out before. They have not been kept under wraps.

When I expressed doubts about that, I was not alluding to any of these things that I am now talking about.

Mr. ANFUSO. What is your opinion now?

Dr. YORK. As far as this is concerned * * *.

As far as other things are concerned, going back to our other session, sir, my opinion today is still essentially the same as it was, but because this is such an obviously important problem, we are right now reviewing it again with the Army and with the Bell Telephone laboratories and with other directly concerned people. I do not expect to have anything new to say on it for a matter of a month or so.

Mr. ANFUSO. Dr. York, what effect will this have on intercontinental missiles going either way?

Dr. YORK. * * *

It does not interfere with cables. If missiles were coming here and we wanted to let the Philippines know there had been a shot in the Pacific, it would interfere with getting the word back and forth. It is an indirect effect rather than a direct effect.

Mr. ANFUSO. The greater the yield, the greater the radiation and the greater the interference on comunications.

Dr. YORK We do not know the precise connection. * * *

There are a number of things that we are uncertain about. That is one of them. * * *

Mr. ANFUSO. What effects will this have on poisoning the atmosphere like strontium 90?

Dr. YORK. We are still working on that question. We do not know the answer.

We know the way the trends are. That is that at these higher altitudes the time during which it takes for material to fall out is very much longer.

At these altitudes it is probably—I am very uncertain about this—but probably getting up into the hundreds of years, that is, * * * I do not know that at all. The theories are not even complete. Unfortunately that is all we are going to have anyway, is some theories on this.

It is probably so long that the strontium has decayed before it has come down. With these small bombs there is hardly any produced in the first place. With big bombs, I really do not know except that it would be less serious by far than doing it on the ground or in the atmosphere.

Mr. MCCORMACK. * * *

Dr. YORK. It is with a view to doing what seems the right thing to do. One possibility is to speed it up, one to leave it where it is; another to slow it down. It is for the purpose of redetermining the facts.

Mr. MCCORMACK. Review would indicate some of the affirmative consideration being given to it under present policy.

Dr. YORK. It probably can be simply stated that we all agree, I think throughout the Government, that the achievement of an antimissile system is of the utmost urgency. What we want to do is whatever is the right thing to achieve that. * * *

The review is based on the fact that here is a very important question that we cannot just look at once and let it settle. It is without any particular preconceived notion as to how it might come out.

Mr. McCormack. We would be in a pretty bad position in 1962 or 1963——

Dr. York. * * *

Mr. McCormack. Is it considered in the scientific field to be a workable project, to continue further work upon?

Dr. York. I think there is simply a divergency of opinion there. There are people who feel it is worth continuing. There are a few who feel it is worth speeding up. There are a few who feel that there just is not anything along this line at all.

Mr. McCormack. Nothing can be done?

Dr. York. Not at least in this particular direction. That is why we have to keep at it all the time.

Mr. McCormack. Are there any alternatives under consideration?

Dr. York. It depends on an alternative for what? * * *

If it is protecting soft targets, such as people, there are some alternatives but none of them look at the moment even as good * * *.

Mr. Osmers. Before I discuss the subject matter, I would like to inquire of Dr. York, how he accounts for the story in the New York Times when this came out in which they indicated that they had had almost all of the information on this subject for months and months and months.

Dr. York. Yes. I can only speculate I am afraid. I do not actually know.

Dr. Shelton might want to add something. But let me say what I know. But let me also really emphasize it is speculation. I know, for example, that the New York Times did indeed have all of this for a long time before they published it.

I first saw Mr. Hanson Baldwin who was the author of part of it—Mr. Sullivan was the author of another part. Mr. Baldwin saw me in the late fall, which was then 5 months before the story was published, and he told me that he had all of this and told me—gave me a list of other things that had been published.

This is all out. Why are you fellows still sitting on this? We discussed it then. But it was evident from those discussions he had most of the facts.

He also had a lot that was confused and mistaken. But among all of this were essentially all the facts. I have understood, not firsthand, but secondhand, that in fact he had the plans for the operation before it ever took place. It was not just a matter of his coming on to this after it happened but even before it happened he knew. It was all secret, restricted data at that time.

So that it is obvious there must have been somewhere at least one important genuine security breach.

Mr. Osmers. I recognize that Dr. York is not a security officer of the Government. But it seems to me, if a metropolitan newspaper has all of this information 6 or 8 months before, let us say, Members of the American Congress had it—I did not have it—maybe some did—it is not the responsibility of Dr. York—but it seems to me we have had here a very serious security breach in a most vital area. I do not see how any conscientious Member of Congress can read the article in the New York Times which broke this whole story and described it in even greater detail——

Dr. York. Not always correctly.

Mr. OSMERS. Perhaps they had it just as completely, just as correctly. I know no one would make a sworn statement that they did not. I presume the Soviet Union knows as much about it as the New York Times. That would be fair. Certainly, if they did not, they probably spent 5 cents that day and bought a newspaper.

Has anything been done to plug that leak?

Dr. SHELTON. I felt operational responsibilities for the projects involved.

The projects were funded through AFSWP, for instance, and we established the security of the various installations. It was made known to me, like Dr. York said; I was aware that the New York Times had information and that they had obtained information prior to our starting the conduct of the test in an operational sense.

It is extremely distressing. As far as I was concerned, I received an order that we were conducting a classified operation. I believe that we were all told that we were conducting these tests on a classified basis.

The fact of the matter is that security failed. I feel something as you do. The basic question is why and where did failure occur and can this country or cannot this country conduct classified operations when ordered to do so?

The CHAIRMAN. I think that is a point, too, there. You gentlemen were before this committee, and this committee probed into the general area, not specifically, about the problem. And at that time the New York Times had that story and not one word was given to that committee. There was no leak on Capitol Hill.

Dr. SHELTON. That is correct.

Mr. OSMERS. All right.

Dr. YORK. There were committees that had been briefed on the subject.

Mr. OSMERS. Am I correct, if Russia is conducting experiments of a similar nature, we never get any information such as published in the New York Times about them?

Dr. SHELTON. We do not even get that much on IGY subjects.

Mr. OSMERS. Is is possible by changing the strength of the bomb and the altitudes to produce fallout in a specific area in the world?

Dr. YORK. No.

Mr. OSMERS. Would it be possible for the Russians, who are always assumed to be the aggressor in discussions of this kind, would it be possible for them to knock out however temporarily our distant early warning system, our radars, and our detection devices?

Dr. YORK. Sticking to this phenomena, sir, * * *.

Of course, an early warning system and communications are an essential part of the picture. We are well aware of that and are looking into the communications problem and how to make certain that does not happen.

Mr. OSMERS. Would the radar that we have guarding the Nation be flexible enough in frequency to take into account the possible disturbances that you might have?

Dr. YORK. Again sticking to Argus, * * *.

It is difficult to change the frequency of a radar. It can be done if it is essential. There are other ways of getting around it, though. * * *

We do not have a full story on that. * * *

Mr. OSMERS. Does Russia have available to it land locations, sir, from which they could launch waves of this contact?

Dr. YORK. Let me make two answers to that.

Using small launchers of the type we did, no. But this could be delivered by an ICBM type warhead and put either so that you are right under the burst—which is the worst situation—or they could, if they wanted to make it complicated, shoot for the other parts of the world so that all we got was the conjugate point.

Incidentally, if they want to interfere and it is a situation of all-out war, you probably do not use tricks like this but you use the more direct approach which is to put the explosion exactly where you want it instead of using some trick of doing it in another part of the world.

Mr. OSMERS. The advantages still remain with the aggressor.

Mr. MILLER. Mr. Osmers asked the question that I was going to ask.

Mr. MCDONOUGH. Has there been any evidence or do we have any knowledge that Russia has done such experiments?

Dr. YORK. * * *

Mr. MCDONOUGH. There has been no interference with our radar systems that might have been artificially launched by Russia?

Dr. YORK. We have no reason to suspect anything of that sort.

Mr. MCDONOUGH. Is the interference of radar of this manmade electronic belt of the same effect—does it have the same effect upon communications as the existing belts——

Dr. YORK. The same kind of disturbances.

An interesting point here, going back now to the high altitude shots where there was interference observed, you find, if you analyze the Pacific networks and the communications in the Pacific over the week that we had these shots, I think what I am saying is substantially correct, we observed a radio blackout at the time of the high altitude shots from Johnston Island.

But elsewhere during that same week there were other blackouts and other legs of communication which were knocked out in the same way and in the same severity.

The only thing is that this is controlled instead of the natural interference with communications, sort of spasmodic. You do not know whether it is going to happen. It is connected with solar storms. The difference is that this was at a precise time and in a controlled location. It was really no different from the natural disturbances which occur.

I think that is true with regard to the length and severity.

Mr. MCDONOUGH. If you can pick your time and place and all can you create a situation at an altitude of * * * to bring about an extremely intense electrical disturbance such as a storm over Russia, over the enemy, or can you control it so that it will not happen over our area?

Dr. YORK. We can do that.

Mr. MCDONOUGH. In addition to communication interference this can be used to bring about artificial weather conditions.

Dr. YORK. No; these so-called magnetic storms only give electrical phenomena. There are no other weather phenomena, like interference with radar. Not even lightning interference with radio.

The term "electric storm" sounds like it means weather in general but it means static. The result is to produce a lot of static in a communication system.

Mr. McDonough. Were you able to observe the difference in temperature in the manmade electronic belt as compared to the existing electronic belt?

Dr. York. There are some differences. They are matters of detail. I cannot give you any good examples of figures. There were differences in the interference of these electrons as compared to the interference of the natural electrons but nothing important.

Mr. Sisk. I simply want to pursue just a little bit further the thought brought out by Mr. Osmers, the gentleman from New Jersey, regarding the security because this is constantly tossed at us on matters that we listen to, and then we indicate, for example, even sometimes in speeches, people ask us questions and we say, well, that is delving into classified material and we cannot talk about it. And they read the same thing in the newspaper next week.

Has there been any check or is there some check going on as to why this leak occurred?

The second question would be this: Under a democracy, is it possible or do we have to admit it is impossible to do these things in a classified way?

Dr. York. The first answer is "Yes."

The answer to the second one we almost made it on this one. This was not all over. There was apparently only one or possibly two, we are not quite sure, one or two leaks, a little statistical fluctuation and there might have been none.

Mr. Sisk. Let us assume the particular newspaper had a certain sense of responsibility to the Nation's welfare; sometimes I wonder about some news media. In view of what I understood you to say that they knew about the operation before this experiment ever occurred, and had it been in line with some of the things that we find in our news media, had they released that—to me, I do not know, apparently your whole security was a failure.

I am not criticizing you gentlemen or anyone else. It is a problem.

Dr. York. All I can say, it was almost a success.

Dr. Shelton. If it had broken prior to the operation— I have real good reasons to believe that we would not have conducted it.

Mr. Sisk. If it had broken before?

Dr. Shelton. Most of them were State Department problems which were not under my purview. Had it been broken and widespread knowledge that we were going off to the South Atlantic, we probably would not have conducted the experiment.

Mr. Sisk. Had it been some less responsible newspaper and had they broken it, these things could substantially interfere with our defense. I think they are grave threats.

Mr. McCormack. You want to read a letter that John Quincy Adams sent to William Murray in 1798. Adams said democracy was like a sieve.

Mr. Sisk. Can we do these things in a democracy?

Mr. Miller. Democracy has lasted all these years.

The Chairman. The least you could say was, if Russia had control of this security, they could stop a project of this sort by releasing it prior——

Dr. YORK. They evidently did not. Despite the fact that the Times had it, I think it is evident the Russians did not.

Mr. BASS. What was the purpose of the Pacific test and how was it related to these?

Dr. YORK. There were several tests in the Pacific. They had lots of purposes. Simply learning about new weapons. The high altitude tests in the Pacific were specifically to look into the matter of how a high altitude explosion * * * how that would interfere with radar and communications, because we had theoretically already worked out the fact that there would probably be interference.

The purpose of the tests or one of the principal purposes of the test was to work this out. They are related to this because of the phenomena which are produced at those two ends and those two auroral regions are similar to what we produced locally at Johnston Island where the shots were burst, similar but not as intense. By studying what happened with those local shots, we learned more about what it is that ionizing radiation and so on in the upper atmosphere will do in interfering with communications.

Mr. BASS. In regard to that * * * shot that must have been below the Van Allen belt.

Dr. YORK. Yes, 'way below.

Mr. BASS. You drew a belt in between the two natural ones.

Dr. YORK. Yes.

Mr. BASS. Did that refer to the * * * one?

Dr. YORK. No. It is all of them. It is a question now of * * * also. This one comes down. The 300 miles is here.

Mr. BASS. You are referring to the * * *?

Dr. YORK. Yes; they were all here. The stuff got up into here and then it circulates back and forth, going above the lower belt. That is when it is in the region of the equator.

Mr. CHENOWETH. I understood you to say this is still in the realm of theory or does it have any practical value?

Dr. YORK. We are not sure. I had mentioned some of the possible practical values. There is both experimental fact and theory here. There is a good mixture of the two.

Mr. CHENOWETH. You are going to continue the experiments?

Dr. YORK. We would like to have the opportunity of learning more about these phenomena.

Mr. CHENOWETH. You feel you cannot continue them in secrecy?

Dr. YORK. You probably cannot continue them in secrecy. The next step would involve a bigger bomb and it would become more obvious.

Mr. CHENOWETH. How long have you been working on this proposal?

Dr. YORK. The Argus part, that is the one involving the trapping of the electrons in the two Auroras, that was first proposed by Christofilos in 1957, 1 month after the sputniks. It was, at the time, his answer to the challenge of the sputniks.

As far as the phenomena which are locally produced by high-altitude shots, those have been under investigation since 1956.

Mr. CHENOWETH. You personally feel, Doctor, this experiment in which you are now engaged is a very vital or will have a vital effect on our whole business of missile and space program?

Dr. YORK. Perhaps not this one; all of these taken as a whole. The high-altitude experiments, combination of all of these, is of vital importance.

Mr. CHENOWETH. You might find something here that will render the other program completely useless.

Dr. YORK. We might, but do not expect to.

Mr. CHENOWETH. What are you seeking to accomplish here?

Dr. YORK. To learn more about what the problem is, what the problem of antimissiles is.

What is the effect of nuclear detonation on radar and so on?

Mr. WOLF. I do not think we are belaboring this point on the question of secrecy and so on. I almost want to ask the question: Why was this session considered secret when the fact is it seems it is so well known? Since we have paid for some more research for Russia——

Dr. YORK. I could comment: A number of the details are not known, for example, as far as the altitude is concerned, it is not known—the details are not known as to what yield it takes to interfere with radio and radar. The general facts are not known too well and the details are not known at all.

Mr. WOLF. We have paid for a fine piece of research for Russia to use against us. What I am curious about is when they decide to set this thing off at Tierra del Fuego to jam us in Washington, what do we have to keep on operating?

Dr YORK. I can comment on several points. One is it would not interfere with telephone—well, with any of the forms of telephone, with landline telephone or microwave telephone.

I do not know if they would actually do that. It is true they could. If you want to interfere with communications in Washington, the best thing to do is put the bomb right here. You can do it by putting it in Tierra del Fuego. I think it is of much greater concern if they put it right here, because then they can interfere with communications by killing us all.

Dr. SHELTON. There is a point of subtleness. Is it an overt act or not to set a bomb off outside the continental country? * * *

The CHAIRMAN. The Chair is going to interrupt here because there are some members leaving. Before you go, this Las Vegas trip comes up—the World Congress of Flight is there. The committee has been polled. I would like to see this morning, before the others get away, what is the reaction. Who is going out there? I am planning to go. Dr. Sheldon, could you make a note of those responding? There will be one plane.

Mr. WOLF. The second phase of this was, if they can upset communications for * * * miles, I noticed you said the short local radio was not affected. Conceivably, you could set up a relay system then of local radio stations.

Dr. YORK. That, in fact, is what the microwave Bell System is—a line-of-sight relays across the country.

Mr. WOLF. It comes back to the fact that you have not accomplished a thing except you have discovered a new phenomena.

Dr. YORK. We have radio communications between Washington and Hawaii. It is a question of what systems are available, what traffic patterns. This problem has been with us all along in connection

with big magnetic storms. We have had to take into account, as in the past, even before this was discovered. This means they can choose the time of this and it would interfere with some of our communications. It would probably interfere more with theirs. They are probably dependent on this.

The CHAIRMAN. Gentlemen, we are going to adjourn promptly for the members to get over there.

Mr. DADDARIO. You said after the experiment was conducted that you watched very carefully through one means or another and you could not find any place where the Russians had been able to pick up any results of this experiment.

Dr. YORK. I said there were no worldwide effects.

Mr. DADDARIO. You said if you had the information that one was onto this experiment that you would have not done it.

It comes to my mind why was not the experiment conducted and since there were no effects, why did you have to confirm the fact that this experiment was about to take place? Why did you have to go to the extent of saying to the New York Times, "Yes, you are right, the experiment has taken place," since they could not have otherwise known it?

Dr. YORK. The New York Times did know it. They not only got information about the shot, they knew before the shot it was going to take place and after the shot they got further information with regard to what had happened.

Mr. DADDARIO. When you say the New York Times got other information after the shot took place; they not only had information right from the start but apparently the same source was able to keep them advised as to the progress——

Dr. YORK. The same or other sources. Who knows what kind of subtle tests are involved here? Once you get a real good newspaperman, and Baldwin and Sullivan certainly are—once there has been a major breach, it is the old problem of getting little bits of information which may not be classified or the man who has it does not understand it but a more knowledgeable man can put it all together.

Mr. DADDARIO. I do not agree with you that since a newspaper gets something, they keep prodding away. I have dealt with intelligence over the years. You can set up blocks. Apparently there is a chain which got the plans into the hands of these people which was able to keep this newspaper informed and if that is the situation, then it must still exist and any program of whatever importance we put through from this point on, we have to assume it is not only in the hands of the newspaper but in the hands of the enemy as well. If someone has so little regard for the security of the country, then they certainly would not have any less regard for the security of giving it to the agents of a foreign country.

This being the case, anything you people do, we must assume is in the hands of the newspapers and the enemy.

Dr. YORK. We share your concern.

Mr. DADDARIO. You would have junked this program. Now, that you know the security leak exists, you are not able to scrap it, are you going to scrap every program——

Dr. YORK. In this case the Soviet Union did not seem to have it.

Mr. DADDARIO. The Soviet Union would not publish that they had the information. Counterintelligence is not to let the enemy know you have it.

Dr. YORK. In this case, they could have caused us considerable embarrassment at any point. I think if they had it, it would have been to their advantage to release it.

Mr. DADDARIO. I don't agree with you at all, from what you have said here as to the nature of this type of experiment. The thing that bothers me is that apparently the security breach here, because of what your colleague said was of such an important nature that you would have described this if you had known about it——

Dr. YORK. I might clarify that. What Dr. Shelton referred to was the fact that we would have not have discussed it because of the technical matters, but the State Department was very concerned about the fact that here was an operation going on in the South Atlantic. That is what he was referring to it, being a funny political situation. We would not have discussed it for technical reasons.

Mr. DADDARIO. From what else you say, am I correct that if the New York Times had not had this information, and this thing had been able to be carried out in a completely classified fashion, there would not have been any release of this story to this point.

Dr. YORK. I couldn't say to this point or not. The plan was to get all the information in, and in fact we did that just about 2 weeks before the Times published their story. Go over it and see what trapping there was. And then that information would have been released. Whether it would have been by now, I am not quite sure. It would have been some time along about now.

Mr. DADDARIO. It has been forced. It has not been an orderly process and not in accordance with your plans.

Dr. YORK. That is correct.

Mr. KING. I have just got back from Salt Lake City. I talked to the newspapers and molders of public opinion back there. They seem to be very concerned about these experiments that go off in the areas that carry such lethal potentiality with regard to the human race. They seem to feel we are tampering with great forces, the implications of which we know not. We are going willy-nilly not knowing where it will take us. If we make a mistake we will sterilize half the race. They take a dim view of the whole thing.

Mr. YORK. I know that people do. This particular experiment, for example, the high altitude experiments we have referred to, just don't do that.

Mr. KING. You know that now, but did you know it before you got into it?

Dr. YORK. Yes. How we could prove it to somebody who wants to believe otherwise, I don't know. My answer would be "Yes," we knew it before and we know it now. I don't know how to prove that to somebody who doesn't want to believe it.

Mr. KING. Do you see any potential danger in pursuing this thing further?

Dr. YORK. I suppose it is possible we could stumble on to something. We do consider this as carefully as we can. To say it is possible, I

guess anything is possible. We are as sure as we can be that it is not possible, that it isn't dangerous.

Mr. BROOKS. Any further questions? If not, the Congress is only going to be in session for just a few minutes, will adjourn so we must go to the floor. We want to thank both of you for being here this morning and giving us the testimony. It will be submitted to you for deletion and then we will release the balance. We will meet again Monday morning at 10 o'clock.

(Whereupon, at 11:57, the committee adjourned until 10 a.m. Monday, April 13, 1959 to consider another matter.)

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